

## Marking Tubular or Roll Formed Products

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Providing metal tubes with better identification has become more important than ever in the past 10 years because of product liability and quality.

Most users of tube or roll-formed shapes require that identification of each piece be placed on the product so quality, size, weight, test data, grade, and other information can be documented.

The three basic ways tube or roll-formed pieces can be marked are:

1. Ink or paint marking.
2. Die stamping.
3. Laser marking and labels.

This article will examine each of these methods and discuss their benefits and limitations.

### Ink or Paint Marking

Originally, paint markings were applied by hand. The worker applied marks to the piece using a paint stick, crayon, chalk, or other marking device. If the worker's handwriting was not good, the risk of losing the piece identity was high, many times resulting in misidentification or scrapping of valuable product.

### Stencils

Later, paint marking evolved into stencil mask marking. Stencil cutting machines were developed to produce consistent readable paint markings.

Workers manually produced stencils made of stiff cardboard or metal which were laid upon the piece, and paint was rolled or sprayed through the stencil mask to mark information on the piece.

Blank fields were left in the stencil to accommodate variable piece-specific information such as length or

weight, which was manually applied using special stencil inserts.

While this marking procedure was still manual, it did produce more readable characters, reducing scrap product. However, the marking process was still relatively slow, as it required stopping the piece at a station where workers could apply the stencil markings to the piece. In many cases, the marking station was the "bottleneck" of the production line.

### Offset Printing

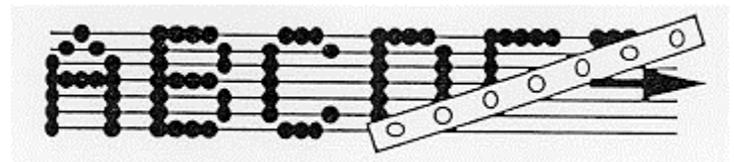
The next evolution in marking came with the introduction of offset printing. This system allows the product to be marked while moving on a conveyor line or by moving the offset printing wheel across a stationary product.

This system is similar to the earlier stencil systems because the message can only be changed by stopping and manually changing the wheel information. Also, the wheel had to ride on the product and would thus pick up oil and scale, reducing the clarity of the mark. This method of marking was probably the most widely used until the dot matrix systems came into existence.

### Dot Matrix

Today, paint marking is accomplished through the use of automated paint marking equipment which can apply dot matrix paint markings.

Each marked character is formed from a rectilinear grid of dots applied by an array of spray nozzles (see Figure 1). The computerized machinery to apply such markings can be designed to mark a moving piece "on-the-fly" or a stationary piece, perhaps even at the previously existing stencil marking station.



*Figure 1 - Seven nozzle print head printing 5 X 7 dot matrix characters.*

The message data can be entered into the marking system via keyboard or can be downloaded from a plant computer, eliminating the need for human entry of the message. Variable weight data and length data, for example, can be automatically communicated to the marker from scales and length systems and then be incorporated into the message if necessary.

Also, serial numbers can easily and automatically be incorporated into the message data, and special characters, such as logos and industry specific identifiers, can be programmed.

Human/machine-readable characters, such as optical character recognition (OCR) characters or human-readable characters accompanied by matching low-density bar codes can be applied using this technology. Automated reading systems can then be used in downstream processes to read the OCR characters or bar codes.

## **Die Stamp Marking**

Die stamp marking has evolved in a similar fashion. Die stamp markings are "permanent" identification which is embossed or indented into the surface of the product.

Manual die stamp marking is still done today by workers who apply die stamp marks using hand-held die holders and heavy hammers. On smooth surfaces, manually-applied die stamp markings can provide satisfactory human-readable marks. The process is slow, however, requiring changing of character dies by hand. Worker safety is also a concern, and occasional injuries result from careless operation.

Automatic die stamp machines have been developed which use similar formed die face technology, but vary message format through the use of rotary die wheels on which multiple dies reside.

Multiple rotary wheels are automatically rotated to a position which exposes the proper die combination to form the identification. The marking head is then impacted or rolled on the marked surface with great

force to indent the die stamp identification into the metal.

Automatic "interrupted dot" die stamp markers have been developed which can apply indented dot matrix markings in a fashion identical to the paint marker described above, whereby each marked character is formed from a rectilinear grid of dots applied by an array of pneumatically-actuated pins.

Since this equipment is also computerized, the message data to be marked is downloaded from a plant computer, eliminating the need for human entry of the message. Variable characters, serial numbers, and logos can also easily and automatically be incorporated into message data.

Machine-readable characters such as OCR characters and low-density bar codes can also be applied using dot matrix technology.

## **Laser Marking and Labels**

Labels and strap-on tags have long been used for the identification of bundles of product. They are easy to print in both human-readable and bar code formats using today's sophisticated laser printing and ink jet printing technologies.

They have the advantage of being able to display large quantities of data in a relatively small area. Newer technologies have produced more durable protective coatings able to survive the elements.

However, to accomplish piece tracking with this technology, the challenge remains how to attach these labels to individual pieces in the mill environment and still survive the process without detaching from the piece or becoming unreadable.

## **Combining Subsystems**

The ink spray and stamping units can be combined with weighing and measuring to provide a system that will perform the API marking requirements.

These requirements are for stamping the couplings and body of the pipe with specific size character for

a given size and grade of pipe. The information stamped is usually the heat number or another identifying number that can certify quality or grade. This message is usually 5 to 12 characters and is stamped near the end of the product.

The ink spray information is placed along the centerline of the tube and contains specific variable information about each tube, such as length and weight, and programmed information such as grade, diameter, test data, country of origin, etc.

## **Summary**

When evaluating various marking systems, first decide if the system should be programmable. If the information changes frequently from piece to piece, automatic marking usually is justifiable.

If this is the case, the next decision is the type of mark, either semi-permanent ink spray or a permanent stamp, either of which can mark a moving or stationary product.

Keep in mind that when using the impact markers, some require a stationary product while others, although they are not programmable, can stamp a moving product.

Ink spray or stamping systems can mark hot surfaces up to 1,900° Fahrenheit, rough surfaces, and wet or oily product to provide identification on most all product surfaces.

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